The international aspects of JCCP, by both authorship and substance of the reported research, have been satisfied more fully than has the interdisciplinary approach which is considered necessary in cross-cultural research. It is hoped that such disciplines as those mentioned above as well as political science, criminology, and psycholinguistics will be better represented in future issues.

We have occasionally found it necessary for manuscript reviewing purposes to go beyond our Editorial Advisory Board. The following scholars cooperated in some way throughout the year in kindly reviewing papers: Professors Santokh Anant, B. G. Burton-Bradley, Fred Fiedler, Harry W. Gardiner, John A. Hostetler, Baerbel Inhelder, Thomas Kellaghan, Wallace E. Lambert, Charles Morris, Robert M. Olton, Norman D. Sundberg, and S. D. Singh. Dr. R. W. Brislin and Dr. George Cvetkovich, both of the Center for Cross-Cultural Research, have been consulted a number of times, and Dr. B. L. Kintz of the Department of Psychology, Western Washington State College, has been a helpful statistics consultant. If others have been omitted, please accept my apologies.

We are encouraged by the large number of subscriptions that have been received, and by the good representation of libraries throughout the world. There is still ample opportunity, however, for an increase in institutional subscriptions and readers are invited to suggest that their local libraries include JCCP in their portfolios. For the next several months all issues of Volume 1, as well as subsequent issues, may be retroactively ordered without additional charge.

A comment is in order concerning reprints, mimeographed materials, experimental and psychometric procedures, addresses given at meetings, dissertations, etc. that we wish to ask readers to send to us. The Center is maintaining a file of materials of this kind, and the data and information will be immediately useful for a book on cross-cultural methodology being prepared by the Editor and our welcome new colleague, Dr. Richard W. Brislin.

The comments and support of many readers who have written to us are truly appreciated, and we hope that both will continue. The subscriptions received and the responses of individual readers suggest that there is indeed a continuing need and a place for the Journal of Cross-Cultural Psychology. The Editors of JCCP have pledged themselves to seek the high level of excellence for the Journal that these needs demand.

--Walter J. Lonner
October, 1970.

cross-cultural psychology
Piagetian theory
thinking, logical
Australia

Journal of Cross-Cultural Psychology
Vol. 1, No. 4, December 1970, pp. 293-304.

A CROSS-CULTURAL STUDY OF CLASSIFICATORY ABILITY IN AUSTRALIA[1]

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An assessment was made of the development of logical thinking of four samples of Australian children. Two of these were samples of full-blood Australian Aboriginal children, one sample living in an isolated, rural, mainly Aboriginal community, and the other sample living in much closer contact with Europeans and their technology. The two samples of European children were identified as high- and low-socioeconomic. The measure of logical thinking was a battery of classificatory tests based on tests developed by Inhelder and Piaget. Marked differences in performance were found between the two European and the two Aboriginal groups, especially on a test of multiple classification. A small sub-sample of very high-contact Aboriginals performed at least as well as white Australian children living in a similar environment. Environmental differences between the four populations sampled were considered to have been a major influence in the performance differences found.

In recent decades, the question of the influence of social and physical environment upon human mental development has claimed the increasing attention of a growing number of psychologists. This emphasis, particularly in North America, has probably supplanted an alternative approach, based on the assumption that certain identifiable groups of people transmit to their progeny different maximal cognitive capacities.

In Australia, too, we find some earlier studies in whole or part directed at this kind of comparison. Porteus and his colleagues, for example, after extensive investigations with his maze and other non-verbal tests of intelligence, found substantial differences between Aboriginal and European Australian intellectual performance in favour of the Europeans (Porteus, 1933). Porteus also tested samples from a number of other ethnic groups, and, on the basis of his results, constructed a hierarchy of ethnic groups in terms of the levels of their intellectual functioning (Porteus, 1966). More recently, a measure of support for Porteus' findings was provided by de Lemos (1969), who reported that a

[1]The research on which this report is based was sponsored by grants from the Australian Institute of Aboriginal Studies and the University of New England.

small sample of part-Aboriginals performed better on Piagetian conservation tests than a group of full-blood Aboriginals in the same environment in Central Australia.

But in Queensland, Kearney (1966) found that Aboriginal children tend to score higher on a battery of non-verbal intelligence tests when they live in close association with Europeans than when they live in more isolated communities. Kearney's approach again emphasises the relevance of environment to intellectual functioning.

The same switch in emphasis has been noted in studies of intellectual functioning within one ethnic group. Early in the present century, Spearman (1904) considered intelligence to be an inherited quality, and relatively impervious to environmental influences. More recently, low intelligence found among many children of Western culture has been considered to be often associated with--and even substantially attributed to--unstimulating environments (Hunt, 1969). Such children are often described as "culturally deprived" or "culturally disadvantaged."

Aboriginal Cognition

Although there is an absence of previous investigation of classificatory ability among Aboriginals, a number of studies have shown that they have not performed as well as Europeans on a variety of mental tests, including the Porteus Maze (Porteus, 1917, 1933), a battery of 7 nonverbal tests (Piddington & Piddington,1932), the Illinois Test of Psycholinguistic Abilities (Hart, 1965), and on Piagetian tests of conservation (de Lemos, 1969). But Fowler (1940) has warned that standardized mental tests are not appropriate measures of Aboriginal mental functioning, while McElwain (1968) has suggested that Aboriginals' lower performances might be explained in terms of the nature and variety of their life experiences, which are less relevant than those of Europeans to satisfactory mental test performance.

Consequently, McElwain and others at the University of Queensland developed a battery of nonverbal tests (the Queensland Test) which employed simple materials and in which communication between examiner and subject was facilitated by such devices as miming and demonstrating the test tasks required before each individual administration. McElwin (1968) describes the Queensland Test thus:

> The Queensland Test is administered individually. The mean time of testing is 45-60 minutes. The test has five item-types, administered in a non-cyclic, omnibus form similar to the Wechsler test rather than to the Binet form:
>
> Knox Cube Imitation Test
> Beads Test
> Alexander's Passalong Test
> Form Assembly Test
> Pattern Matching Test

> Among the features common to these test types are
> (i) the material is completely nonverbal in both administration and response
> (ii) all the material is nonrepresentational; there are no pictures, and no object used in the test has a common use or meaning
> (iii) in all the tests the goal of the test is clear.
> Generally, the tester invites the subject to imitate some manipulation of material towards an overt goal. The tasks are then made progressively more difficult [pp. 13-14].

Although the Queensland Test was shown to be characterised by both predictive validity and substantial score variance, it could be argued that the range of abilities tapped tended to be somewhat narrow for it to be regarded as a test of intelligence.

Three cross-cultural studies of other ethnic groups are of interest at this point. Price-Williams (1962) found that Nigerian children lagged a year or so behind European children in classificatory ability, whether or not they had been to school, though Bruner, Olver, and Greenfield (1966) subsequently found that schooling did make a difference to the performance of African children in tests based on stimulus equivalence. Goodnow (1962) found small differences between children from various European and Chinese milieus in Hong Kong on conservation and combination tests. These studies leave the question of the influence of race and milieu on classificatory performance rather inconclusively answered.

The question of a relationship between milieu and mental functioning has appeared under another guise in some reports of a possible association between the mental test scores of Aboriginals and the extent of their contact with Europeans. Gregor and McPherson (1963), for example, using the Porteus Maze test, and Kearney (1966), using the Queensland Test, noted the performance of Aboriginals tended to vary directly with the extent of the contact they had experienced with Europeans and their technology. The result might be due to opportunities for high-contact Aboriginal children to learn to perform the specific tasks of these tests. Another possible explanation is that Aboriginal children in close contact with Europeans might enjoy a richer variety of experiences than remote Aboriginal children, and the cognitive growth rate of high-contact Aboriginal children might thereby be accelerated.

Milieu Effects among Europeans

Consideration of milieu effects upon levels of cognitive functioning have not, of course, been confined to Aboriginals. European children encountering a greater-than-average variety of life experiences which match the mental schemata established at any given time in the course of their mental development (Hunt, 1961) are also likely to show faster cognitive growth than disadvantaged European children. Both the range and the ordering of the experiences of disadvantaged children are likely to be restricted (Deutsch, 1963), and such children tend to be characterised by low intelligence-test scores, especially on verbal tests (Eells et al., 1959), by low school achievement (Choppin, 1967)

and poorly developed language and communication skills (Bernstein, 1960; Deutsch, 1963; Lawton, 1968), and by a low socioeconomic level (Whiteman & Deutsch, 1968).

In a study in Italy, Peluffo (1967) administered conservation tests to city born-and-bred children, rural children, and children who had originally lived in the country but had since moved to a city. He concluded from his results that a "low cultural level" or an "underdeveloped milieu" does not stimulate the development of operational thinking, though transfer to a more favourable milieu may do so.

As a result of these studies, an outstanding question is whether classificatory ability and milieu are associated in each of the major ethnic groups in Australia. It was the purpose of the present study to try to answer this question, and to attempt a comparison of performances of Aboriginal and white Australian children living in similar environments.

METHOD

The samples

To meet the aims of this study, a relatively advantaged sample and a relatively disadvantaged sample of children were drawn from both European and full-blood Aboriginal populations. The two European populations, which were drawn from Sydney, were described as high-socioeconomic and low-socioeconomic, insofar as they occupied extreme positions on the occupational prestige scale of Congalton (1963). Thus the fathers of the high-socioeconomic European children were professionals or executives, while the fathers of the low-socioeconomic European children were semi-skilled or unskilled manual workers. The two Aboriginal populations were designated high- or low-contact, according to an index of contact (de Lacey, 1970a) calculated for each population. From each population, about 10 children were randomly sampled at each age range from 6 to 10, though some younger European and some older Aboriginal children were also included.

The index of contact was designed to express compositely the effect of 17 variables considered to contribute to contact with Europeans. These variables were the proportion of the school population that was European, whether English was the mother tongue, whether English was used by the adult community, whether English was used by peer groups, the proportion of the school teachers who were European, and the degree of access the children had to the mass media of communication. These six variables were considered to be essentially language variables. The remaining variables were the proportion of the community population that was European, the frequency of visits to European houses, shopping experiences of the children, travel to centres of European population, access to European artifacts, European-style school physical environment, persistence of the indigenous culture, European games and hobbies, European food, home physical environment and European-type community organisation.

The reason for identifying the first six as language variables was that

Smith (1966) in Queensland has shown that an inverse relationship obtains between the amount of English verbal content in mental tests and Aboriginal children's scores on them. Consequently, in calculating the indices, a double weighting was arbitrarily assigned to the language variables. Scores of 0 to 2 were allotted for each variable (0 to 4 in the case of the language variables), and each total score was expressed as a decimal fraction of the total possible score. The indices calculated for the low- and high-contact samples were respectively .13 and .83. The low-contact Aboriginal children lived at Aurukun ($N = 63$) and at Weipa ($N = 23$), on the west coast of Cape York peninsula of northern Queensland, and the indices of contact for these locations were respectively .07 and .30. The high-contact children lived at Palm Island ($N = 45$) and Townsville ($N = 34$) on the north-eastern Queensland coast, and their indices of contact were respectively .71 and .98.

The Nature of Classification

The measures of classificatory ability, it has been noted, were four tests based on the classification tests of Inhelder and Piaget (1964). The term "classification" in the present context refers neither to simple sorting procedures nor to stimulus equivalence. Rather, in its technical sense, classification implies an understanding of the relationship between extension and intension. Extension is defined as the variety of species in which a common character is shown, while intension is the common character to be seen in this variety (Joseph, 1916). Extension is thus the list of class members (if the class is finite), while intension is the defining attribute, or criterion, of the class.

In their Geneva studies, Inhelder and Piaget (1964) describe a number of different kinds of classificatory skills. Of these, we are concerned with two which are indicators of the transition from pre-operational to operational stages of cognitive development. These two kinds of classification are additive (involving the use of quantifiers of hierarchical classification) and multiplicative (requiring the application of two or more attributes simultaneously). Inhelder and Piaget found that additive and multiplicative classification develop in parallel or simultaneously.

The Test Battery

The battery consisted of four tests. The first test examined the children's ability to use the quantifiers "some" and "all" appropriately, implying an understanding of the relationship between a part and the whole of which it is a part. The materials, which were identical with those of Inhelder and Piaget (1964, p. 60), were small blocks of wood, 3/4" x 3/8", and in the form of red or blue squares or circles, arranged in a line and attached to a piece of cardboard. The original four questions of Inhelder and Piaget were used: Are all the circles blue? Are all the red ones square? Are all the blue ones circles? Are all the square ones red? In the manner of the clinical method, additional questions or prompts (such as "Show me which ones," "Point to them") were put

after each principal question, until the experimenter was satisfied that the child understood the question, and that, in turn, the experimenter understood the intention of the child's response. To ensure that the younger children understood the terms "red," "blue," "circles," "squares," and "round," they were shown and invited to handle replicas of the wooden squares and circles from the test, and were asked to indicate examples of the terms.

The second test consisted of five questions on hierarchical classification. The materials used constituted a four-tier hierarchy: all objects in a basket, food and other objects, fruit and other food, and bananas and oranges. The five questions posed in this test were modeled on questions of Inhelder and Piaget (1964, p. 101). They were:

1. If we put all the fruit in another basket, will this one (indicating an an orange) go in?
2. Is a basket of all the bananas more or less than a basket of all the fruit?
3. Is there more fruit or more food?
4. If we eat all the oranges, will there by any fruit left?
5. If we eat all the fruit, will there by any oranges left?

The third test was a multiple-classification test similar in design to Raven's Progressive Matrices. "Operational" solutions (in Piaget's terms) to each of the 8 multiple-choice items required selection of the correct option according to two or three simultaneous criteria, which the child had to nominate. The criteria were various combinations of shape, colour and orientation. In addition, subjects had to show some resistance to the experimenter's suggestion that another option would solve each item as well as the one chosen. The materials were again based on those of Inhelder and Piaget (1964, pp. 160-161), though some of the content was changed to elements more familiar to Australian children (e.g., Swiss flowers were replaced by hands and feet). There were 4 two-criteria items and 4 three-criteria items.

The fourth test was Nixon's reclassification test (Nixon, undated), which required subjects to perform 6 reclassifications according to new criteria defined each time by two examplars. The materials consisted of 20 wooden rods about 2 inches long, varying in 3 attributes: height, diameter, and colour (Figure 1). The following is an example of a reclassification task from this test: The set of four red rods and the set of four white rods are grouped before the subject to be reclassified. If the tall red fat rod and the tall red thin rod are selected and are moved to new and separated positions as exemplars, the only possible solution of the reclassification will be a grouping according to the criterion of diameter. A response was considered to be operational when the reclassification was correctly executed, and also when the new distinguishing criteria were indicated (e.g., "These are all fat, and those are all skinny"). Since the administration procedure for this test is standardized, the clinical method was not used.

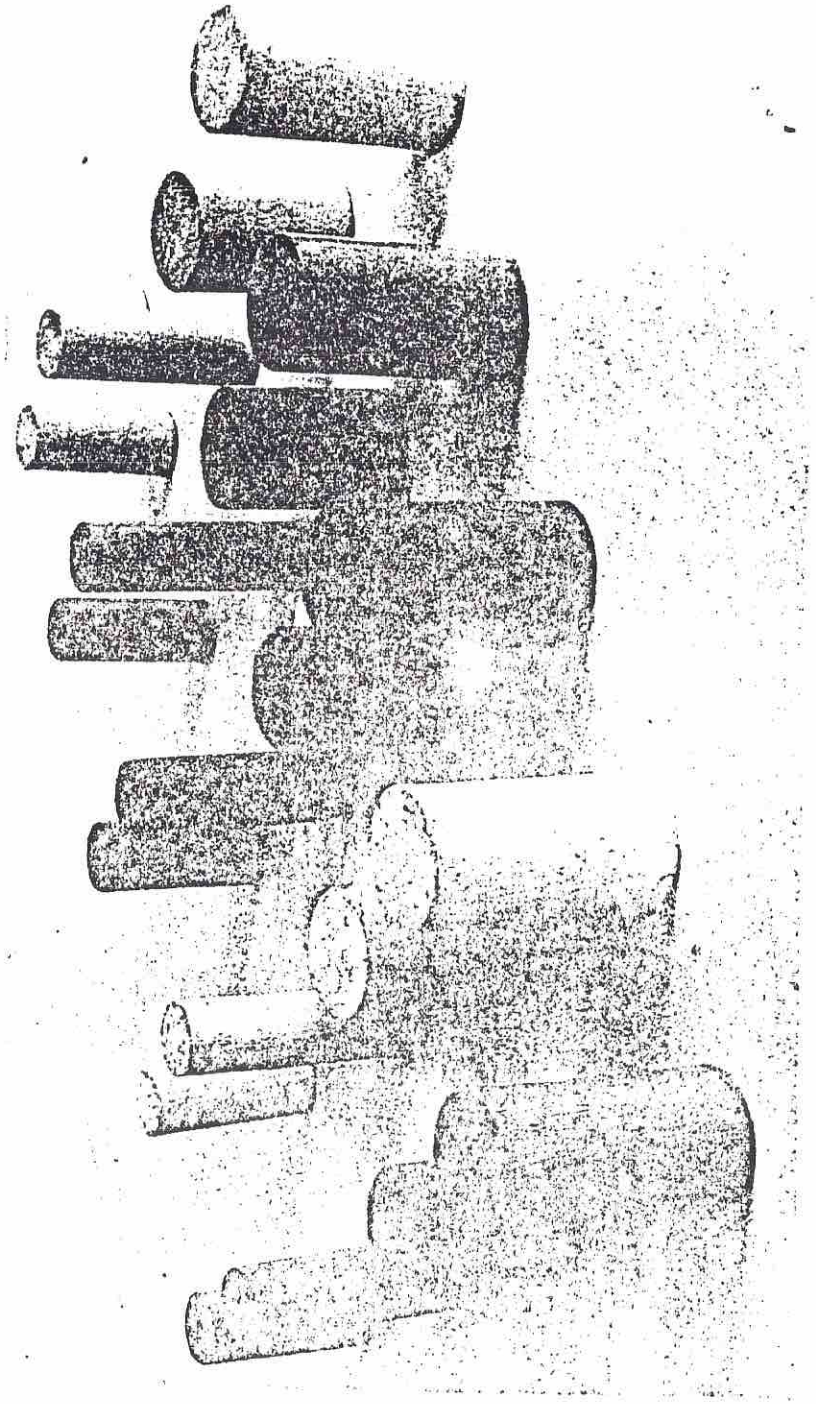

Fig. 1--Materials for test number 4 (reclassification test).

RESULTS

Two analyses were made of the results. The significance of any differences was tested by means of nonparametric statistics (χ^2 for pooled ages, and the Mann-Whitney U test for those individual age groups where there were sufficient scores). The statistical analysis, which is given in detail elsewhere (de Lacey, 1970b), showed that significant differences in test performance ($p < .01$) were revealed by either one or both of the statistical tests between low- and high-contact Aboriginals, and between low- and high-socioeconomic Europeans. On the other hand, no such differences were found between high- contact Aboriginals and low-socioeconomic Europeans, though the χ^2 test applied to our Tests No. 3 and No. 4 showed differences where $.05 > p > .01$.

The second analysis was carried out by inspecting tables of mean scores for each age range in each sample and for each test (de Lacey, 1970b). There was general agreement in inferring trends by both methods.

The results consistently showed a relationship between the milieus and the classificatory performance of the children (Figures 2-5). In all four tests, the order of performance among the four samples was: high-socioeconomic Europeans highest, low-socioeconomic Europeans second, high-contact Aboriginals third and low-contact Aboriginals lowest. This order obtained whether the criterion applied was the proportion of total items answered correctly (expressed as operational-item percentages), or the proportion of the total sample judged to respond operationally (i.e., percentage of subjects giving consistently right answers at each age level).

When the high-contact Aboriginal sample was considered as very high-contact (Townsville) and medium-contact (Palm Island) subsamples, the Palm Island children performed at a level between the total high-contact sample and the low-contact Aboriginal sample. The performance of the Townsville children, on the other hand, was generally indistinguishable from the performance of the low-socioeconomic Europeans (Figures 6 through 9). The Palm Island and Townsville subsamples were too small to compare at all, meaningfully, with any other group.

While all four tests discriminated between the four milieus, the test most sensitive to milieu differences was the matrix test. The low-socioeconomic Europeans and both Aboriginal samples scored lower on this multiple-classification test than on the two additive classification tests (Tests 1 and 2). However, like the other three tests, the matrix test did not reveal any differences between the very-high-contact Aboriginal subsample and the low-socioeconomic Europeans.

Among the Aboriginals, there was a consistent and strong direct relationship between classificatory performance and the degree of contact with Europeans and their technology. Similarly, there was a consistent and direct association between socioeconomic level and test performance among the European children.

Inferences regarding the high performance of the very-high-contact Aboriginals might properly be made with some caution, for they numbered only 34. There is, however, no reason to suppose that Townsville Aboriginal

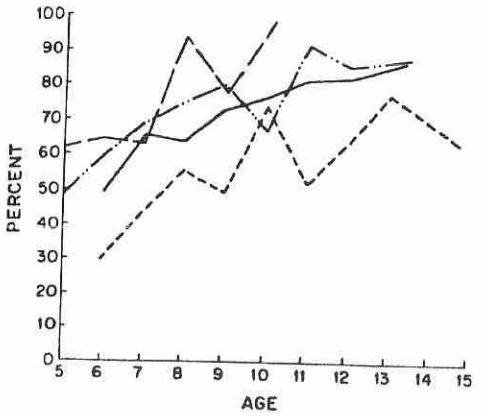

Fig. 2.--Operational-item percentages: Test No. 1 (questions on use of "ALL").

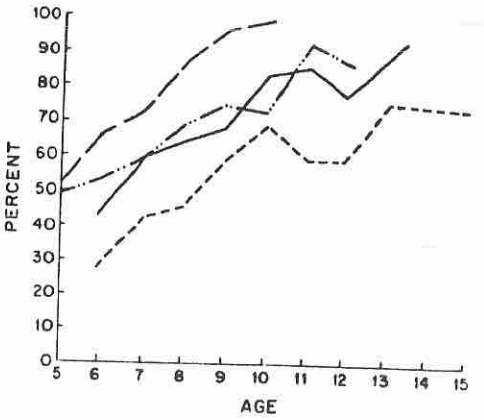

Fig. 3.--Operational-item percentages: Test No. 2 (hierarchical classification).

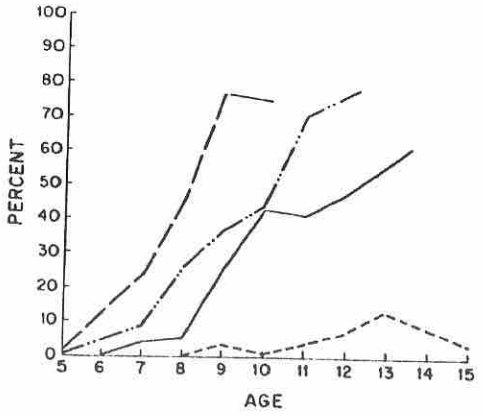

Fig. 4.--Operational-item percentages: Test No. 3 (multiplicative classification).

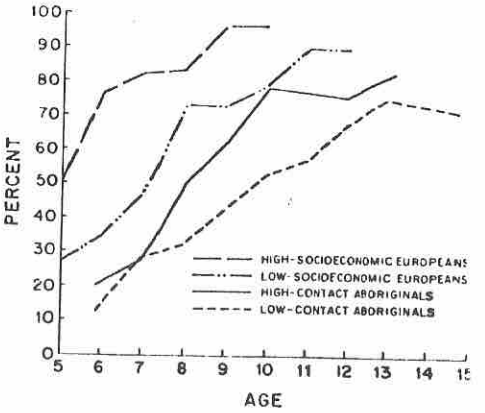

Fig. 5.--Operational-item percentages: Test No. 4 (reclassification).

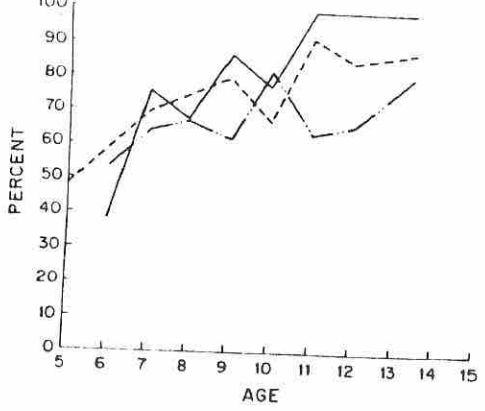

Fig. 6.--Operational-item percentages: Test No. 1 (questions on use of "ALL").

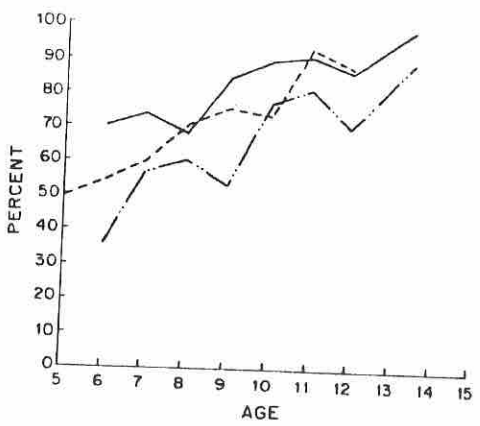

Fig. 7.--Operational-item percentages: Test No. 2 (hierarchical classification).

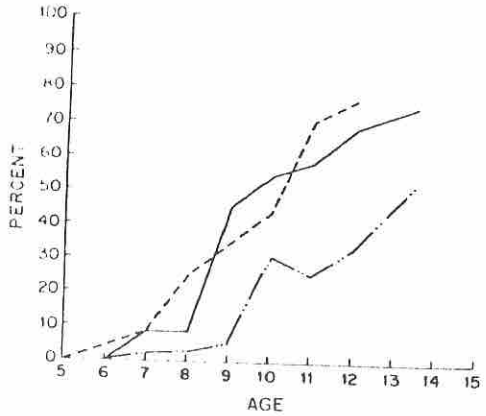

Fig. 8.--Operational-item percentages: Test No. 3 (multiplicative classification).

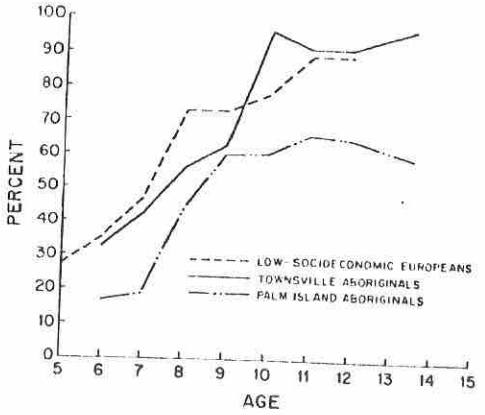

Fig. 9.--Operational-item percentages. Test No. 4 (reclassification).

children are substantially different from any other urban full-blood children. Indeed, they probably constitute a substantial part of the population of urban full-blood Aboriginal children, who are not particularly numerous in the few towns they inhabit, for generally the higher the contact the Aboriginals have with Europeans the less they tend to be full-bloods.

It was possible to make a meaningful comparison of performances of Aboriginal and European children only at the low-socioeconomic urban level, for there are almost no middle-class Aboriginal children; neither are there to be found any groups of European children living in huts in remote reserves or missions. The environment of the high-contact Aboriginals was generally considered not to be quite as stimulating as the low-socioeconomic Europeans. It has been noted that the differences in the test performance of these two samples are not as decisive as the differences between the other pairs of samples.

CONCLUSION

A marked relationship has been demonstrated between the degree of enrichment in children's environments and the particular area of mental growth manifested in the ability to classify. Further, this relationship is to be found in both Aboriginal and European children. It seems to be sufficient to explain the differences found in classificatory performance in terms of environmental differences. Particularly in the case of the low-contact Aboriginals, these environmental differences might include malnutrition in foetal and early postnatal life, resulting in an attenuated braincell population and shown to occur among Aboriginals in the Northern Territory of Australia (Narcombe, 1970). Although this influence cannot be ruled out of the present study, the Aurukun Aboriginals generally have access to adequate protein food, and, under the supervision of a qualified nursing sister, the infants are fed regularly with daily issues of milk.

The results of this study also imply that the parallel development between additive and multiple classificatory ability reported by Inhelder and Piaget (1964, p. 289) might occur only where the child's environment provides a favourable opportunity for cognitive growth, as in the case of our high socioeconomic European sample.

That the relationship between milieu and classificatory ability was found to obtain so unequivocally throughout the test battery points to possible important implications for Aboriginal welfare policy. If the present findings are shown to replicate, it could be argued that the interests of the optimal cognitive development of Aboriginal children would best be served by ensuring that they should in the future be reared near or even integrated with substantial European settlements. Selective migration is unlikely to be a major contributory factor, since the greater part of the Townsville and Palm Island Aboriginals are the descendants of an Aboriginal settlement which was completely evacuated after a hurricane destroyed their homes in a more remote region further north some 50 years ago. In more general terms, the findings of this study lend a measure of support to the notion that the variety and nature of a child's life experiences are crucial determinants of his level of cognitive functioning.